

# Making Shipping Green

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Shipping provides a host of economic benefits, from providing jobs to connecting the Commonwealth with international trade routes. What are the environmental consequences of reaping these rich economic rewards? How can these environmental impacts be managed and reduced? Through its Green Ports Program, the U.S. Environmental Protection Agency's (EPA) Office of Water is focused on answering these questions and helping U.S. ports combine environmental stewardship with good business. As an important step toward this goal, the EPA funded the *Environmental Management Handbook*, prepared by the American Association of Port Authorities in 1998, to provide practical information for incorporating environmental stewardship into port operation practices. Later, EPA contracted the Urban Harbors Institute at the University of Massachusetts/Boston to develop a compendium of case studies of innovative and cost-effective strategies used by ports throughout the country to remove, reduce, and/or remediate environmental impacts of shipping and other port practices. In 2000, the Urban Harbors Institute released *America's Green Ports: Environmental Management and Technology at US Ports*.

This article looks at many of the environmental impacts and solutions discussed in *America's Green Ports*, focusing on the following shipping issues: air quality, dredging, endangered and threatened species, oil pollution, and solid waste.

## Air Quality

Shipping vessels, like all hydrocarbon-burning motor vehicles, emit harmful pollutants to the

air, such as hydrocarbons, nitrogen oxides, and soot. Other sources of air pollution from the shipping industry include the release of xylene, toluene, and methylene bromide during ship painting and cleaning; benzene, toluene, xylene, and other toxins from fuel vapors; and benzene, toluene, xylene, hexane, and ethyl benzene from loading and unloading marine tank vessels. According to the EPA, impacts of these pollutants may include adverse health effects, such as respiratory and cardiovascular disease, lung damage, learning impairment, and even death; depletion of upper-atmosphere ozone; damage to agricultural resources; and increase in acid rain, endangering forest and plant communities.

*America's Green Ports* gives an example of how the port of Los Angeles is working to deal with air quality issues. The port retrofitted two tug boats with state-of-the-art equipment to optimize engine efficiency by reducing fuel combustion temperatures, resulting in a 25 percent reduction in air emissions. Cost and performance benefits are also expected, such as longer times between overhauls, reduced maintenance costs, better engine performance, and reduced fuel consumption.

## Dredging


To maintain safe navigation depths, many harbor channels must be periodically dredged. This process is greatly complicated by an unwanted legacy of industrialization, i.e. sediment contamination. Sediment contaminants can include heavy metals, polychlorinated biphenyls, polyaromatic hydrocarbons, dioxins, pesticides, oils, greases,



and organic matter. If these toxins are released to the water column during dredging, they can pose a significant threat to the ecosystem, particularly through bioaccumulation through the food chain. If they are not properly contained during disposal, these pollutants can have similar effects on the aquatic or terrestrial environment where they are placed. Even uncontaminated dredged materials can have negative environmental impacts when improperly placed in areas where they can smother animals and plants or significantly decrease water quality. The dredging itself can also have significant adverse impacts if scheduled or undertaken improperly.

Under current law, all dredging projects must be designed and constructed to protect human and ecological health, and some dredging projects are designed specifically to generate environmental benefits. When Port Canaveral, Florida, was constructed in the 1950s, jetties used to stabilize the entrance channel interrupted the natural flow of sand. This sand blockage caused serious erosion on beaches to the south and made annual

*The Argo Merchant ran aground in Nantucket Shoals, 29 nautical miles southeast of Nantucket, dumping 7.7 million gallons of fuel into the Atlantic.*



maintenance dredging to keep the channel open a necessity, with the dredged materials deposited at an offshore disposal site. In 1991, the U.S. Fish and Wildlife Service prohibited the continuation of the dredging approach because of potential impacts to endangered sea turtles. The Canaveral Port Authority came up with an alternative plan to remove and reuse beach-compatible sand from the dredged material. The sand is separated and moved to a site a half-mile offshore of the city of Cocoa Beach, where it becomes part of the sand system of the area, renourishing the eroding shore. Monitoring results after the first year indicate that the sand is effectively moving landward, reducing erosion problems and ultimately enhancing nesting habitat for the endangered sea turtles and other animals.

Right here at home, the Boston Harbor Navigation Improvement Project serves as a case study for innovative disposal options for contaminated sediment. After extensive sediment testing and environmental planning, the solution selected for contaminated materials was to dig disposal cells in the bottom of the harbor under the channels being dredged, place the contaminated material in these cells, and then cap them with clean material. Keeping the disposal sites within the dredging footprint eliminated the potentially significant impacts that would have resulted from disturbing another site or transporting this contaminated material, and capping ensured that the material would be removed from the harbor environment.

## Endangered and Threatened Species

Animal and plant species that live in ports, as well as the animals that visit, are vulnerable to pollution and noise impacts, as well as ship strikes and encounters with port machinery. An important tool for protecting all species, particularly those that are endangered and threatened, is an inventory of local plants and animals. For those in particular trouble, specific management plans will be required. Here are some examples of how ports are working to “live and let live” with endangered species.

In Port Canaveral, Florida, infrastructure modification and public education have been used to minimize injury to the endangered Florida manatee. Fenders along the channels were modified to give enough room between vessels and walls for manatees to escape without being crushed. Sewer outfalls were covered with grates to prevent the manatees from entering and getting caught in the pipes. Port users were also educated about the presence and movement of manatees in the port, and instructed on the best way to avoid these gentle creatures.

In Massachusetts, the Port of Boston is working to protect the endangered Northern Right Whale, focusing its efforts on educating mariners who pass through whale feeding grounds on the way to and from Boston. Educational tools developed and distributed include a brochure that describes the whales’ behavior and includes photos for identification; a one-page laminated guide to mariner activity around whales; and a 15-minute training video. In addition, the port has set up a sighting network, transferring information about the location of whales from the

scientists who collect it to the ships in the area. For more on shipping and right whales in Massachusetts, see pages 20-23.

## Oil Pollution

Oil released to marine ecosystems is a major environmental problem associated with the shipping industry. Large spills, which usually occur during transportation accidents like oil tanker groundings, have a catastrophic impact on local plant and animal populations. These incidents are relatively rare, however, and are not the major source of oil in the marine environment. Instead, the cumulative impact of many minor spills is the major culprit, contributing 70 percent of all maritime oil pollution. Although some of this oil is directly released into the water, much is released on land and is transferred to the ocean in stormwater runoff. Small spills from ships occur during fuel loading and off-loading, tank washing, wastewater discharge, bilge water release, and engine maintenance. Oil contains hydrocarbons with BTX compounds (benzene, toluene, and xylene) and toxic metals such as zinc, chromium, copper, and cadmium, which are hazardous to humans and the environment. The impacts include poisoning of marine life, feeding disruption, chronic disease, reproductive problems, and deformities in young. These problems can be exacerbated through bioaccumulation of the toxins through the food chain. In addition, oil pollution degrades coastal habitats, smothering tidal pools and killing marsh grass.

Recycling used oil is an approach some ports are using to help address the oil pollution problem. The Port of Cordova in Alaska collects used oil from harbor users and the surrounding community in convenient dockside oil disposal tanks. A bilge water vacuum pump is also provided for boaters to clean oily bilge water, as well as a facility to collect and treat oily bilge water from larger ships. All the oil collected is tested for contaminants and then transferred to a local utility company, which burns the oil to produce heat. The facility's industrial boiler is certified by EPA for burning both clean and contaminated oil. Public education efforts encourage everyone to participate in this free, cost-effective program.

In the Port of Newport, Oregon, oil filters from commercial and recreational boaters are also recycled. Specially constructed double-walled steel collection tanks are placed in commercial and recreational marinas. An industrial oil filter press crushes the filters and squeezes out the excess oil, which is recycled with the other used oil collected. The filters are also recycled.

### Solid Waste

All ships produce solid waste during voyages. Most of this waste can be legally disposed at sea, as long as it is released a specified distance from shore. Plastic, however, must always be properly incinerated or

disposed of on land. The amount of solid waste generated is staggering, with cargo ships in the U.S. alone generating more than 111 billion tons of garbage each year. Waste collection and management on shore is not well regulated or consistently managed, and only a minority of vessels actually off-load trash. In addition to legal and illegal ocean dumping, solid waste from shipping enters the environment when cargo is lost at sea, or accidentally released during ship loading and unloading. The impacts of solid waste in the sea include wildlife entanglement and ingestion of materials, particularly plastics; disabling of vessels when debris becomes wrapped around propellers; and aesthetic impacts.

In Oregon, the Port of Newport's Marine Refuse Disposal Project was established as a demonstration project to improve the shoreside management of ship solid waste. Ten refuse facilities were constructed and conveniently placed near boat berths, along with recycling bins

for metal, wood, nets, and cardboard. Fishermen, port workers, and managers were also asked to identify solid waste management issues and develop solutions. As a result, a water-level barge was adapted to help fishermen off-load heavy items for disposal and a refuse and recycling area was constructed near the service dock, where a hoist is available for removing heavy materials.

Clearly, many innovative efforts within the shipping industry are working toward making shipping more "green." For a complete PDF copy of *America's Green Ports*, which also covers brownfields, community relations, habitat restoration, and land-based water pollution, go to [www.uhi.umb.edu/pdf\\_files/greenports.pdf](http://www.uhi.umb.edu/pdf_files/greenports.pdf). For more on EPA's Green Ports Program, see [www.epa.gov/owow/oceans/greenports/](http://www.epa.gov/owow/oceans/greenports/) or for the American Association of Port Authorities *Environmental Management Handbook* see [www.aapa-ports.org/govrelations/env\\_mgmt\\_hb.htm](http://www.aapa-ports.org/govrelations/env_mgmt_hb.htm).



*Plastics in the ocean are more than a litter problem when seals and other animals become entangled.*